Clinical Findings and Management in Pediatric Respiratory Disorders

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This is a concise description of the clinical manifestations frequently seen in the more common respiratory disorders affecting pediatric patients. After a brief description of each disease, the clinical findings and management associated with the disorder are summarized in table format. Students are cautioned that the tables represent a summary of the "classic" findings and management in moderately advanced cases. In reality, the occurrence, degree and management of the typical findings vary with the severity of the disease and the patients overall health status. The tables are intended to serve as a reference and to help the student mentally organize the clinical manifestations and management of the more common respiratory disorders in logical format.

Laryngotracheobronchitis

Laryngotracheobonchitis {LTB}, also referred to as croup, is a viral respiratory infection primarily involving the upper airway(s) and producing characteristic clinical findings. The subglottic edema that develops produces a partial laryngeal obstruction, which has most effect in the area of the cricothyryriod ring. Since this is the narrowest portion of the child's airway, any swelling that develops produces a substantial increase in resistance to ventilation.

The most common causal organisms of the LTB are parainfluenza virus, respiratory syncytial virus, and adenovirus. The typical clinical findings for larygotracheobronchitis are as follows.

Patient identification	**Occurs in children usually less than 3 years of age**
Chief complaint	**Dyspnea; barking cough; inspiratory stridor**
History of present illness	**Gradual onset of problem commonly after a "cold"; symptoms may be worse at night; onset usually in fall and winter months**
Past history	**Noncontributory**
Family history	**Noncontributory**
Vital signs	**Tachypnea; tachycardia; low-grade fever**
Inspection	**Child does not appear to be acutely ill; may appear anxious in mild distress**
Palpation	**Normal**
Percussion	**Normal**

Auscultation	**Normal lung sounds; may hear inspiratory stridor in neck region**
Chest radiograph	**Shows bottleneck narrowing of trachea below larynx**
Blood gas levels	**Usually show mild respiratory alkalosis and hypoxemia; may progress to respiratory acidosis and moderate hypoxemia in more severe cases**
Clinical laboratory findings	**Nonspecific**
Pulmonary function	**Not applicable**
ECG	**Nonspecific**

Management of Laryngotraheobronchitis (LTB)

Croup with no stridor; stridor only with crying – observe only

Croup with stridor at rest – Racemic epinephrine 1:10 q2-4h; hospitalization required; if there is improvement observe; if there is continued stridor at rest, obtain ABG, if Arterial blood PaO_2 and $PaCO_2$ are normal, continue recemic epinephrine; if Arterial blood PaO_2 is decreased and the $PaCO_2$ is increased, Increase FiO_2, repeat arterial blood gases, continue recemic epinephrine, consider steroid use, and maintain intake with IV fluids.

If there is no improvement and there is an increasing $PaCO_2$ and a decreasing PaO_2 with the infant tiring, translarygeal intubation must take place via the oral or nasotracheal route. Also, obtain gram stain and culture secretions. Use antibiotics, if indicated and mechanical ventilation.

Extubate when clinically indicated.

No stridor at rest; send home if parents can observe closely and provide humidity via room vaporizer.

Hydration – push fluids

Instruct parents to return to hospital if stridor is persistent > 5 min. at rest. Call emergency services if stridor worsens, severe respiratory distress occurs, child turns blue, is drooling or is agitated.

Epiglottitis

Epiglottitis, an inflammation of the epiglottis, is a bacterial infection that primarily affects pediatric patients, but may also affect adults. The swelling of the supraglitic structures causes a substansital upper airway obstruction to ventilation and may produce sudden and complete obstruction. It has been suggested that the term *supraglottitis* is more applicable, since the condition also causes inflammation of the arytentoids and aryepiglottic folds.

Epiglottitis is most commonly caused by *Haemophilus influenza* type B, but may also be caused by *Streptococcus* and *Staphylococcus* organisms. Although it occurs less frequently than LTB, Epiglottitis potentially represents a more serious problem in terms of airway patency and matainence. The following is a list of the typical clinical findings associated with Epiglottitis.

Patient identification	**Occurs most often in children approximately 3 to 6 years of age**
Chief complaint	**Marked Dyspnea and inspiratory stridor; muffled voice; sore throat; dysphagia**
History of present illness	**Sudden onset with rapid worsening; after a "cold"; onset usually in fall and winter months; lack of appetite**
Past history	**Noncontributory**
Family history	**Noncontributory**
Vital signs	**Tachypnea; tachycardia; high fever**
Inspection	**Characteristic sitting position leaning forward with head and neck extended and drooling; cyanosis occurs in more severe cases; intercostal retractions; visualization reveals large cherry red epiglottis. Visualization or disturbance of the epiglottis may easily precipitate a complete airway obstruction. It should be performed only when necessary, and the appropriate equipment and personnel to place an artificial airway should be immediately available at the bedside.**
Palpation	**Normal**
Percussion	**Normal**
Auscultation	**Normal lung sounds; may hear inspiratory stridorous sound may be transmitted from epiglottic area; lung sounds may be significantly decreased**
Chest radiograph	**Usually normal; may show enlarged epiglottis (lateral neck x-ray film positive for epiglottic swelling three to four times normal)**
Blood gas levels	**Usually show hypoxemia; respiratory acidosis in more severe cases**

Clinical laboratory findings **Blood cultures frequently positive for Haemophilus; leukocytosis with left shift; throat cultures usually not done**

Pulmonary function **Not applicable**

ECG **Nonspecific**

Management of Epiglottitis

Immediate intubation – Do not attempt to visualize epiglottis (do not use tongue depressor) until totally prepared to intubate or trach patient. Ideally, an anesthesiologist, otolaryngologist, or respiratory care practitioner should accompany the patient to the O.R., where the patient is anesthetized and intubated by an expert in airway management. Allow patient to "sit up" en route to O.R. It has been reported that "looking" at the epiglottitis with a tongue depressor or laryngoscope blade has caused epiglottic constriction and total airway obstruction. A trach may need to be performed in this case. Most deaths from epiglottitis occur in the first few hours after arrival at a hospital (presumably due to inadequate airway management)

Oxygen as needed

High humidity

Hydration

Antibiotic therapy

Treat resp. failure (as needed)

Minimize anxiety and manipulation

Prevent self-extubation

Be ready to reintubate at all times

Cystic Fibrosis

Cystic fibrosis (CF) is an inherited disease that affects the exocrine glands. It is also referred to as mucoviscidosis and fibrocystic disease of the pancreas. The primary areas of the body that are affected include the lungs, gastrointestinal tract, and sweat glands. Cystic fibrosis is characterized by thick mucous secretions that impair pulmonary hygiene. The resulting sputum retention promotes infections, atelectasis, airway obstruction, and bronchiectasis. Over a period of years, pulmonary fibrosis, hemoptysis, pneumothorax, and cor pulmonale may occur in more severe cases. The clinical findings associated with CF are as follows.

Patient identification	**Occurs equally in males and females; predominately in Caucasians; usually diagnosed in childhood**
Chief complaint	**Dyspnea; productive cough; hemoptysis usually occurs in advanced stages**
History of present illness	**Change in color; consistency or volume of sputum production; fever**
Past history	**Chronic lung infections; chronic diarrhea. Meconium ileus**
Family history	**May be positive for cystic fibrosis**
Vital signs	**Tachypnea; tachycardia; high fever**
Inspection	**May be normal; increased anteroposterior diameter will occur in advanced stages; digital clubbing; increased JVD; cyanosis; malnourished appearance**
Palpation	**May be normal; decreased chest expansion**
Percussion	**May be normal, decreased resonance with consolidation or atelectasis occurring in advanced stages**
Auscultation	**Inspiratory and expiratory crackles and wheezes**
Chest radiograph	**May be normal; hyperexpansion; fibrosis in more advanced stages; consolidation**
Blood gas levels	**Mild hypoxemia; progresses to severe hypoxemia and respiratory acidosis**

Clinical laboratory findings	**Increase in sweat chloride greater than 60mEq/L; sputum cultures often positive for *Staphylococcus aureus* or *Pseudomonas aeruginosa***
Pulmonary function	**Obstructive defect early; restrictive defect late**
ECG	**Nonspecific; may show sinus tachycardia, right bundle branch block**

Management of Cystic Fibrosis

High humidity therapy with small particles to liquefy secretions.

Hydration

Chest Physio Therapy (CPT) with postural drainage, percussion, and vibration in all pd positions, 2-4 x per day. (Caution – hemoptysis and pneumothorax are frequent complications, discontinue CPT until resolved.

Breathing exercises, O2 therapy for hypoxemia (esp. at night)

Bronchodilators, Mucolytics, Decongestants, Expectorants; USE PRN ONLY!

Antibiotics (aerosols and systemic) and ^ CPT for infections

Nutrition – High protein, carbohydrate and salt diet, pancreatic and fat-soluble vitamin supplements

Bronchoscopy and lavage if necessary

Intubation and ventilation if indicated

Respiratory Distress Syndrome

Respiratory distress syndrome (RDS) of the neonate has had many synonyms, among them hyaline membrane disease, infant respiratory distress syndrome (IRDS), surfactant deficiency syndrome, and pulmonary hypoperfusion syndrome. RDS is primarily caused by either a deficiency in or an abnormality of, pulmonary surfactant. This, in turn, may cause a closed loop amplification system of atelectasis, reduced pulmonary compliance, depressed alveolar ventilation, hypoxemia, pulmonary vasoconstriction, decreased pulmonary metabolism, and further reduction in surfactant production. Some factors that predispose an infant to RDS include premature birth, maternal diabetes, prenatal asphyxia, and prolonged labor. The resultant reduction in lung compliance causes an increased work of breathing and the following clinical findings.

Patient identification	**Primarily occurs in infants of less than 34 weeks gestational age**
Chief complaint	**Respiratory distress**
History of present illness	**Rapid onset of respiratory distress within 6 hours of birth**
Past history	**Noncontributory**
Family history	**Uncontrolled maternal diabetes**
Vital signs	**Tachypnea; tachycardia**
Inspection	**Nasal flaring**
Palpation	**Noncontributory**
Percussion	**Noncontributory**
Auscultation	**Diminished air entry; fine inspiratory crackles; expiratory grunting**
Chest radiograph	**Diffuse haziness (ground glass) air bronchogram; cardiomegaly**
Blood gas levels	**Hypoxemia; may progress to severe respiratory acidosis in more severe cases**
Clinical laboratory findings	**Noncontributory**
Pulmonary function	**Reduced compliance**
ECG	**Nonspecific**

Management of Respiratory Distress Syndrome (RDS)

Prevent (if possible)

Delay premature delivery with tocolytics

Promote surfactant production: Administer corticosteroids (beta or dexamethasone): Aminophylline, Thyroxine, Prolatin; indicated only if < 34 weeks gestation and delivery is expected within 24-72 hours. Do not give if delivery is immediate! (It is ineffective in male newborns)

Support until spontaneous resolution occurs:

Provide O2 (most important part of management), Prevent hypoxemia (> 80) Use continuous monitoring TcO2 or oximeter

Provide CPAP and/or mechanical ventilation as needed

Maintain temperature (critical aspect) and glucose

Maintain proper ABG's

Maintain BP and HCT (40-45%)

Minimize handling of infant

Avoid nipple feeding with tachypnea or Dyspnea

Treat with antibiotics (until Group B strep is ruled out)

Provide postural drainage, percussion and vibration (often not recommended in first 48 hours)

Suction PRN (esp. after 48 hours)

Provide sedation if fighting the ventilator (morphine, chloral hydrate, diazepam)

Administer aerosolized surfactant

High Frequency Jet Ventilation (HFV) - is indicated if infant is failing conventional mechanical ventilation or severe pneumothorax, PIE, or BP fistula

Extracorporeal Membrane Oxygenation (ECMO) – is indicated if infant is failing mechanical ventilation and HFV.

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Links to other World Wide Web sites with information about respiratory disorders:

American Academy of Allergy, Asthma, and Immunology

American Academy of Pediatrics (AAP)

American Lung Association

Centers for Disease Control and Prevention (CDC)

National Heart, Lung, and Blood Institute

National Institute of Allergy and Infectious Diseases

United Network for Organ Sharing (UNOS)